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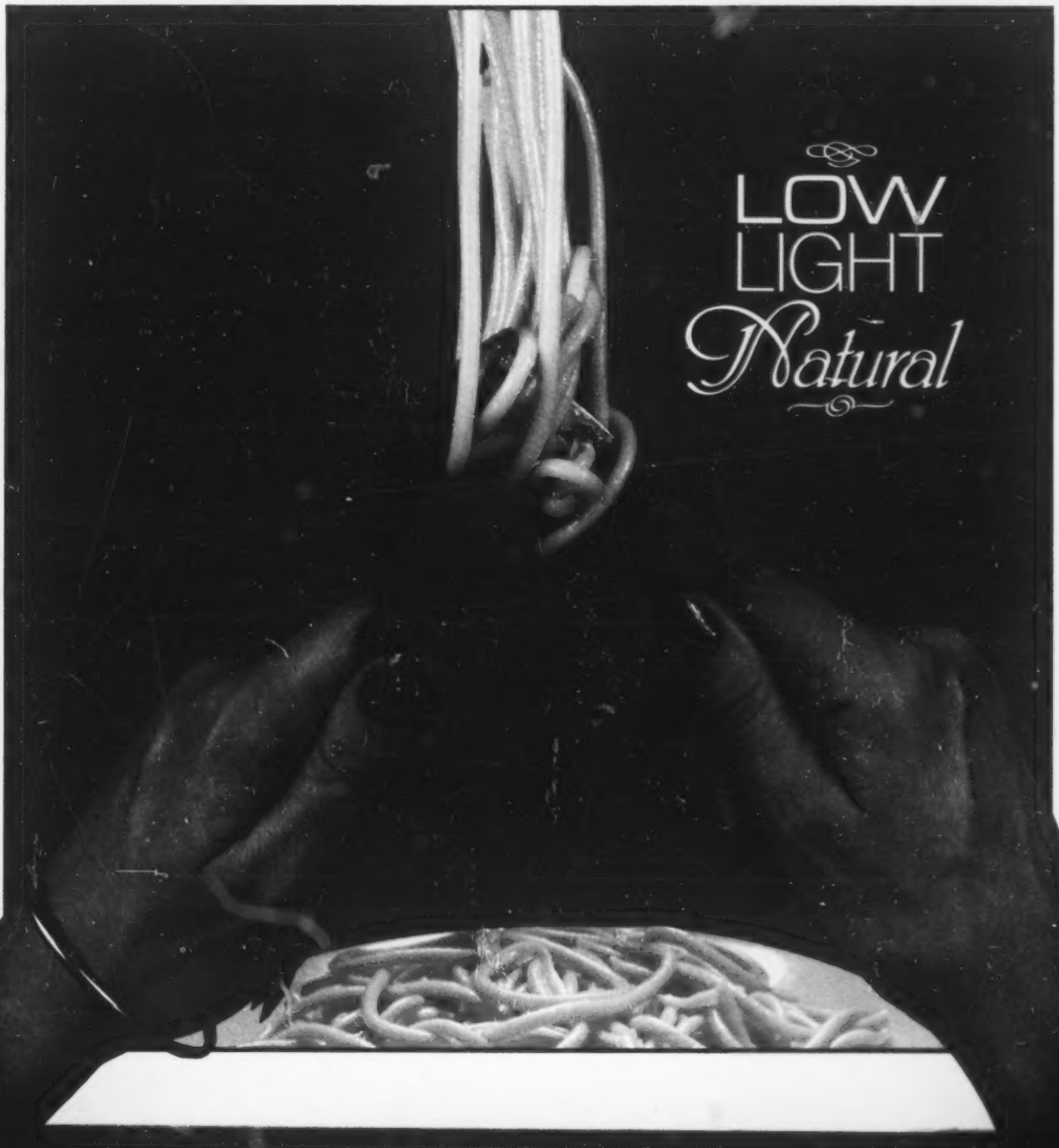
FOOD ENGINEERING

SINCE 1928, THE SOURCE ON PROCESSING, PACKAGING, AND PRODUCT DEVELOPMENT



FOOD ENGINEERING

COVER STORY

The American consumer wants it all – convenience with little or no cooking and cleanup combined with nutritional balance, low calories, high quality and good taste.

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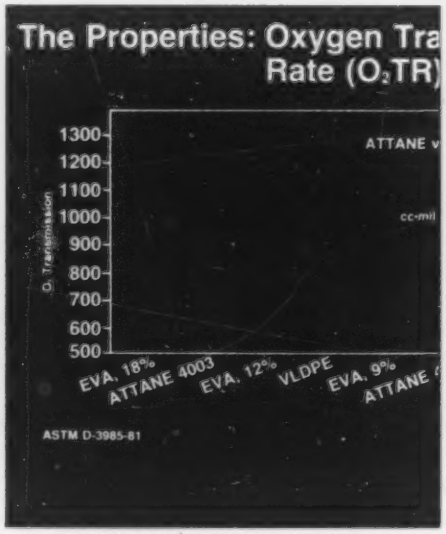

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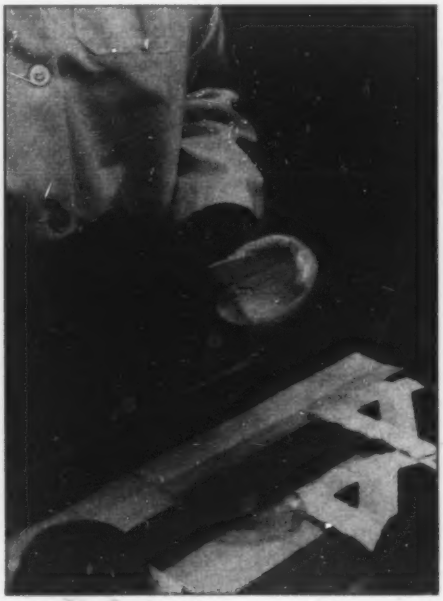

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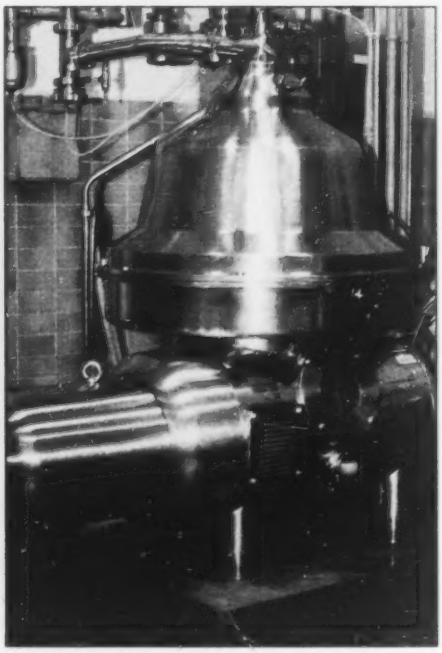

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Special Emphasis

IMPORTS MAY SHIFT OIL, EMULSIFIER MARKET

Health concerns and technological breakthroughs coupled with increasing foreign imports stir up the industry.

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IMPORTS MAY SHIFT THE MARKET

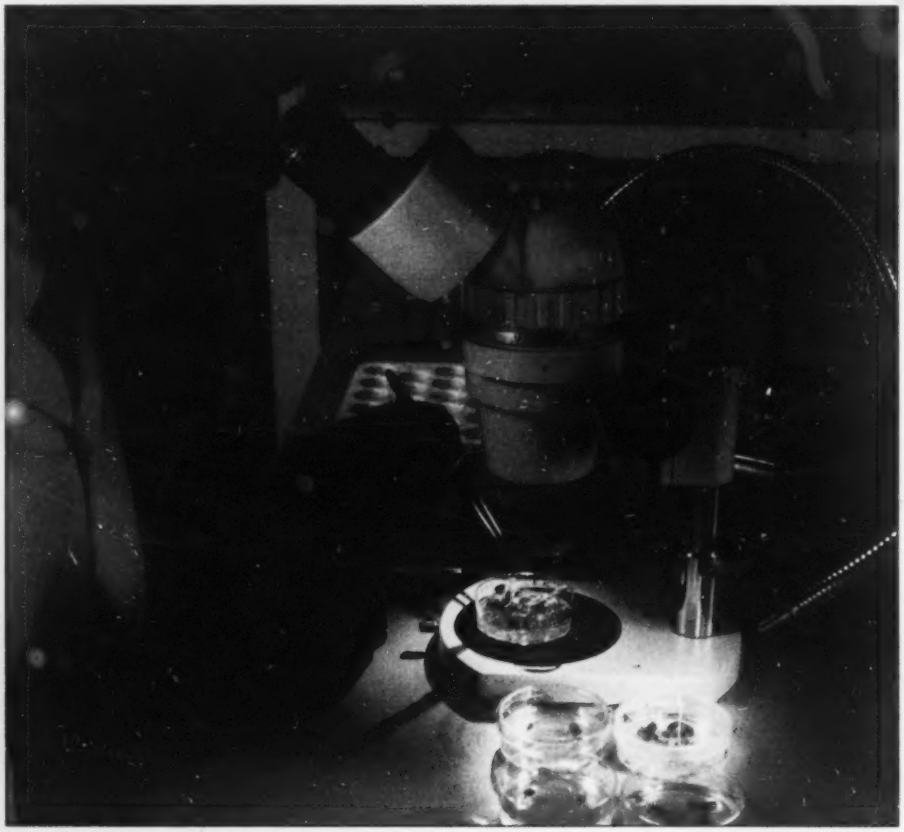
Shifts in the market caused by new foreign contenders, advances in technology, and the controversial cholesterol war continue to stir up the oils and emulsifiers industry.

Health concerns, technological breakthroughs in oil extraction processes and biotechnology coupled with a market influenced by increased foreign production is changing the oils and emulsifiers industry.

For example, while domestically produced soybean oil continues to dominate the market, competition is expected to increase from rapeseed oil (which will most likely grow in importance over the next decade) and the "tropical" oils – coconut, palm and palm kernel.

With the US trade embargo on domestically grown soybeans in the early '70s, South American countries such as Brazil, Argentina and Paraguay jumped on the bandwagon and began to market their soybeans to the world. At the same time Malaysia began to increase its production of palm oil, and between 1984 and 1986, the US tripled the amount of the palm oil it imported, according to Business Trend Analysts, Commack NY. Then palm oil prices fell below those of soybean oil, and the competitive race was on.

JOYCE FASSL
Managing Editor



Advanced biotechnology techniques are changing the oil industry. Shown here is the isolation of sunflower shoots in culture. Photo courtesy Sungene Technologies, San Jose, CA.

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Supply of Edible Fats and Oils

Supply[1]	(in million of pounds) 1978	1981	1983	1986
Soybean	12,052	12,715	12,133	12,810
Cottonseed	1,367	1,631	885	1,175
Edible Tallow	963	1,137	1,396	1,684
Lard	1,107	1,093	999	899
Corn	810	948	1,142	1,432
Sunflower	261	328	544	551
Peanut	188	191	152	223
Coconut	1,113	1,164	1,061	1,346
Palm	351	276	482	801

[1]Supply equals stocks plus imports plus production for the year beginning October 1.

Source: U.S. Department of Agriculture; and Business Trends Analysts, Commack, NY

The supply of palm oil has more than doubled since 1978.

The approval of rapeseed oil (or canola oil, an export of Canada) by the FDA in 1985 also caused a shift in the market. Rapeseed oil can be substituted for soybean oil in most food products, including margarine, mayonnaise, salad dressing and shortening. Rapeseed oil is less costly to produce than soybean or corn oil because it does not need to undergo a winterizing treatment to prevent it from separating. But its price remains at a premium because of transportation costs during importation from Canada.

"Anything that comes in displaces what is already here," said Dave Kinard, Manager of Education and Research Services at the National Cottonseed Products Association, Memphis, TN. And canola, now mostly a specialty item, has the potential to make gains, Kinard said.

Jumping on the canola bandwagon in mid-1987 was Bunge Edible Oil, Kankakee, IL, who announced two canola (lear) based high stability oils. Hi S-N is a canola-based high stability oil offering 90 plus hours Active Oxygen Method (A.O.M.) with no additives or preservatives. Hi S-N 200 provides 200 plus hours A.O.M. On the retail front, Proctor & Gamble's Puritan Oil, made from canola oil, was on the market back in 1986.

Although the US fats and oils industry is up against some competition from producers overseas, it still leads the way with production of soybean oil and is making inroads with products such as olestra, the calorie-free oil from Proctor & Gamble (P&G). Pending FDA approval, olestra (also known generically as sucrose polyester) has the taste, appearance, texture, and cooking properties of natural oil, and is made by substituting sucrose for one of the two components of the fat molecule glycerol.

Late last year The Center for Science in the Public Interest asked FDA to deny approval of olestra, claiming it causes cancer, liver damage and other serious problems in animals. P&G refutes the claim and stands behind the safety of its product, explaining that the safety of olestra is backed by extensive scientific research.

If approved, olestra could revolutionize the oil and especially the low calorie food markets. Approval could come in the United Kingdom this year, followed by possible US approval in 1989. (For more information about olestra, see our cover story on the low, light and natural product trend on page 53 of this issue.)

Rising Imports

According to Business Trend Analysts, since 1978 demand from manufacturers of edible products for domestically produced fats and oils has risen 2.1 percent annually to 13.8 million pounds in 1986.

The two fastest growing end-use markets have been salad/cooking oils and baking/frying fats. These two areas have upped their consumption 2.8 percent and 2.5 percent annually due in part to the ever-growing fast food industry. Soybean oil continues to make gains with consumption up 2.2 percent yearly. The total supply of oil stocks jumped 3 percent in 1986 because of the palm, coconut, peanut, and rapeseed oils that are showing up more and more from foreign contenders.

It is important to keep in mind that coconut, palm and palm kernel oil account for less then five percent of the total oils consumed. Canola, on the other hand, is seen as the rising star.

Over the last decade one of these foreignly produced oils has made its mark more dramatically to consumers than any other: palm oil. Palm oil, as well as palm kernel and coconut oils, is found in many of the cookie, cracker, snack and cereal products Americans eat every day.

The changing roles of "good" and "bad" fats and oils has caused confusion in consumers and problems for processors. And the increase of coconut oil, and especially palm oil, into American diets has caused much debate.

Oils high in saturated fatty acids have been shown to raise blood serum cholesterol levels, which may lead to heart attacks. Polyunsaturated fats have been shown to reduce serum cholesterol. Because of their high content of saturated fatty acids, fats such as butter or lard do not melt at room temperature. In contrast, vegetable oils are liquid because of their high content of unsaturated

fats. Exceptions to the rule: palm and coconut oils. Palm oil contains about 50 percent saturated fat, coconut about 92 percent, while soybean, for example, contains only 15 percent saturated fat. Despite its high level of saturated fat, the palm oil proponents say its make-up inhibits the build-up of cholesterol.

"Given other sources of saturated fat and cholesterol in the diet, people who need to modify their intake of saturated fat would be much more successful if they focused on other things that contain both saturated fat and cholesterol," said Steven Laning, VP of Research and Development for Capital Cities Products Company, Columbus, OH.

What most people seem to need to be reminded of is that no vegetable fat or oil contains cholesterol. In fact, food cholesterol comes from meat, eggs, milk, cheese and other animal products. All in all consumers would do well to reduce total fat in the diet, rather than just reducing the highly saturated fats such as coconut and palm oil.

According to research from Lipid Nutrition Lab, Human Research Center, in Beltsville, MD, the total amount of linoleic acid in the diet, and not its proportion to saturated fat is the determining factor in blood pressure level. Linoleic acid is the main polyunsaturated fatty acid in safflower, corn and soybean oils. According to this study, people would get the most benefit from reducing total fat while increasing vegetable oil in their diets.

While palm and coconut are seen as the "bad" guys, olive oil and the omega-3 fatty acids found in fish oils have been emerging as the heroes. Why? Because they are known to reduce overall blood cholesterol level, while at the same time increasing levels of high density lipoproteins, and destroying the low density lipoproteins (which nutritionists agree are bad). But, the fish oils brigade also has opponents. According to a speech presented at an American Heart Association meeting, the Eskimos of fish oil/low cholesterol fame had low cholesterol not because of the fish in their diets, but because they lead less stressful lives and eat small amounts of red meat. And in fact, some research shows that fish oil slows inflammation along artery walls, which may lead to hardening of the arteries.

Another one of the "good" oil guys is canola oil, which contains only 6 percent saturated fat, 36 percent polyunsaturated fat and 58 percent monounsaturated fat. Canola oil is lower in saturated fats than any other edible oil and contains high concentrations of omega-3 fatty acids.

Oil labeling

Legislation before the House of Representatives proposes required labeling of tropical oils and fats. The bill states that a product containing vegetable shortening in the form of tropical oil should identify the specific oil and designate it as a saturated fat.

The bill's opponents claim that legislation requiring a manufacturer to declare specific types of oils on the label eliminates their ability to choose oil based on price and availability. Manufacturers would either have to buy in large quantities or print different labels to deal with this legislation, placing a tremendous cost burden on the food industry, which would probably be passed on to the consumer.

Testifying before the House Agriculture subcommittee on Wheat, Soybeans, and Feed Grains, Acting Director of FDA's Center for Food Safety and Applied Nutrition Richard Ronk said that the so-called tropical oils cannot be classified together on the basis of their effects on blood lipids because these effects are distinctly different.

Ronk went on to say that it would be overly simplistic to assume any vegetable product containing a saturated fat in any amount will have adverse blood cholesterol consequences. Vegetable oils that are primarily unsaturated, such as soy and sunflower, can be saturated through hydrogenation (a process which reduces the degree of unsaturation of the fat) to achieve a particular effect in food. Therefore, the same health concerns that generally apply to both saturated fats apply as well to unsaturated fats that become saturated through the hydrogenation process, according to Ronk's testimony.

New technology

New extraction processes as well as biotechnological advances are also changing the face of the oils industry.

Oil industry shipments increased over 40 percent from 1977 to 1987. Photo courtesy Cargill, Minneapolis, MN.

Fats and Oils Industry Shipments

	(in millions of dollars)			
	1977	1982	1986	1987
Cottonseed oil mills	$ 859	$ 933	$ 904	$ 940
Soybean oil mills	7,580	8,604	8,854	9,208
Vegetable oil mills	361	557	582	605
Animal/marine fats & oils	1,655	1,753	1,869	1,944
Shortening & cooking oils	4,025	4,906	5,743	5,972
Total	14,480	16,753	17,952	18,669

Source: U.S. Department of Commerce: Bureau of Census, and International Trade Association (ITA).

The EPEX extraction process from Sverdrup, St. Louis, MO, produces commercial grade edible oil without chemical refining, and also produces all-natural edible meal. Using only natural ingredients, the process may outmode current technology that uses a highly explosive chemical, hexane, as a solvent.

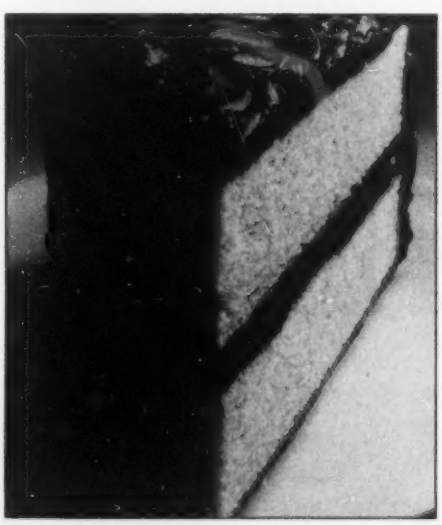
The process (which is not supercritical extraction) has shown economic and environmental advantages over methods previously used by the vegetable oil industry. The oil produced has less than 0.1 phospholipids when deodorized.

The EPEX method involves:

- Preparing the soybeans or other edible oil seeds so that the extraction of oil from the prepared feed stock is easy and economical.
- Producing oil and meal at a lower production cost which are higher in quality than products produced using current extraction processes.
- Using no explosive solvents and containing all natural additives. Thus the products can be labeled "natural."
- Eliminating the need for chemical refining in producing commercial salad oil.

Those benefitting from the process include extractors and refiners and large end users such as commercial salad oil distributors and mayonnaise and salad dressing manufacturers. A new plant employing this technology should be built by summer.

Advances in biotechnology within the oil industry are underway at Sungene Technologies, San Jose, CA. Sungene received three patents last year for its advanced biotechnology processes to produce improved lines of sunflower plants from cell and tissue culture. This patented process results in sunflower seed having oil containing more than 95 percent oleic acid using one process and more than 80 percent linoleic acid using another process. With the controversy on fats and oils in the diet, these techniques will play a significant role in the oil industry. Sungene is involved with similar biotechnology work with other oilseeds including rapeseed, soybean and sesame.



Emulsifiers can eliminate shortening in cake mixes. Photo courtesy Durkee, Cleveland, OH.

Specialized emulsifiers

Specialized uses of emulsifiers and increased interest in natural products is the focus of the emulsifier industry.

Central Soya Company Inc., Fort Wayne IN, plans to expand its Bellevue, OH de-oiled lecithin processing facility, with construction set to begin in August. This expansion represents an increase of about 25 percent of current worldwide industry capacity, according to the company.

"Broad-base growth in special emulsifiers coupled with the food industry's interest in natural sources ingredients have created product demand," says Dr. D. L. Williams, senior VP of Central Soya's Chemergy Division, commenting on the planned expansion.

Reducing fat content in food formulations is the goal of *Dur-Lo*, a vegetable oil mono- and diglyceride emulsifier from Durkee, Cleveland, OH. Unlike similar emulsifiers, Dur-Lo is low in alpha mono content and relatively high in diglyceride content. It can replace all or part of the shortening content in cake mixes, cookies, icings and numerous vegetable dairy products, as well as reduce calories in these products.

Riceland Food Inc., Little Rock, AK offers *Lecigran*, a high phospholipid lecithin powder. By removing nearly all of the crude oil, this product does not interfere with flavor and its powdered form makes it easy to work with.

Eastman Chemical Products' (Kingsport, TN) emulsifier line includes *Myvatex* Monoset food emulsifier for stabilizing peanut butter that has good mouth feel and mouth release, has excellent spreadability in a wide temperature range, is resistant to oil separation, and has good stability at high temperatures. It is made from hydrogenated vegetable oils and distilled monoglycerides derived from vegetable oils. Myvatex SSH food emulsifier for baking is a concentrated product that is predispersed with an extended shelf-life. This hydrated crumb softener is prepared from distilled monoglycerides derived from edible vegetable oils. *Myverol* distilled monoglycerides contribute to the stability in products such as margarine (either regular or diet, and also spreads).

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